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GENyO Expands Analytic Capacity for Precision Medicine

Biomedical research center increases throughput for big data analytics with a Bull* system from Atos*, powered by Intel® Xeon® processors

The Center for Genomics and Oncological Research (GENyO) needed more robust infrastructure to support the rising demand for bioinformatics analysis and large-scale projects. GENyO selected a powerful Bull* supercomputer from Atos* based on the Intel® Xeon® processor E5 family. Now the center is increasing its scientific productivity on high-profile projects that will help contribute to new precision diagnostic capabilities, pharmaceutical breakthroughs, and more efficient public health services for Spain's Andalusian Region.

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> IT Manager, GENyO

Challenge

- A multidisciplinary research institute focused on the genetic basis of human diseases, GENyO needs scalable, high-performance computing resources to turn clinical and genomic data into scientific insights that ultimately improve human health. Its small cluster and individual workstations were swamped by growing demand.

Solution

- GENyO deployed a Bull B520 blade system from Atos, with each node powered by Intel® Xeon® processor E5-2640. The system provides more than 11 teraflops of computing power and 2.25 terabytes of RAM.

Results

- Researchers enjoy increased performance, scalability, and reliability. They have the flexibility to run diverse projects, including many that involve sophisticated analysis of heterogeneous data sets.

- GENyO accelerates strategically important research that can help pharma companies create new treatments and support the Andalusian Department of Health's drive to bring precision medicine to the region's 9 million citizens.

- With compact, energy-efficient technologies from Intel and Atos, GENyO reduces power consumption and frees floor and rack space, supporting future growth requirements.

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>
> **—Marta Alarcón Riquelme**
> Scientific Director
> Genomics Unit and Medical
> Genomics Department, GENyO

A Growing Need for Advanced Analytics

From cancer to autoimmune disorders, tomorrow's cures will come from biomedical analytics as well as from test tubes and laboratories—and GENyO is committed to finding those cures. Located in Granada, Spain, GENyO is on the forefront of research in genomic medicine and genomics oncology. GENyO also leads in translational medicine, developing practical tools and methods that allow researchers to make the most of genomics data and will help clinicians understand and apply research findings. GENyO's funding comes from the pharmaceutical giant Pfizer, the University of Granada, and the Andalusian Regional Government.

Advances in genome sequencing, proteomics, and other high-throughput "omics" technologies offer unprecedented opportunities to identify the molecular basis

Genyo   Atos

for diseases and design targeted treatments. But first, researchers must integrate and analyze vast, diverse, and rapidly growing data sets.

At GENyO, the rising requirements outpaced the existing infrastructure and led the center's leaders to search for a robust and flexible new platform. "The way we do biomedical research is changing," said Dr. Pedro Carmona-Sáez, head of GENyO's Bioinformatics Unit. "We are producing more data and running more large projects, and we need computers to extract value from all the data—both the data our support units are generating and the many public databases. We reached a point where our computing resources were insufficient to deal with the amount of data being generated and run our analyses in a reasonable time."

Transforming Research and the Data Center

Carmona-Sáez said GENyO chose the Atos system with Intel® technologies because of the system's high-performance hardware and software, Atos' expertise, and both companies' future roadmaps. And, he added, "We are happy. We have excellent performance and reliability, and we have the flexibility to support a broad range of applications. The new cluster brings new users and new collaborations, and we have the capabilities to support them."

With the new system, GENyO has transformed its bioinformatics research capabilities. "The new cluster has meant a huge step forward for our researchers," said Alberto Ramirez, IT manager for GENyO. "On the cluster, they are able to run more processes in parallel, work with bigger data sets, and get answers faster."

The platform also adds value in the data center. "Physical space played a key role in selecting the solution," Ramirez explained. "With the Bull blade system, we have 18 computing nodes in a physical space of only 7U, including the networking hardware. This makes a huge difference because it allows us to place the entire cluster—the power supply, storage servers, login nodes, and so forth—in a single rack. We also benefit from the energy savings that blade systems provide compared to traditional standalone servers."

Systems Medicine Unites Clinical and Omics Information

Among the projects to benefit from the new system are those on the leading edge of the emerging field of systems medicine, bringing together clinical and omics data. A great example is PRECISESADS, a large-scale collaboration to investigate the molecular origins and influences of systemic autoimmune disorders such as lupus and rheumatoid arthritis. PRECISESADS, which includes participants from 12 European countries, is sponsored by the Innovative Medicines Initiative (IMI) from the European Union and in-kind contributions from the international pharmaceutical industry. It has enrolled more than 2,000 patients and collected a variety of clinical samples for each patient, along with genomic, epigenomic, and other data.

"With all the molecular and clinical data we are gathering and sharing, and all the computational power we now have, we are beginning to develop more precise diagnostic criteria for these systemic diseases," said Dr. Marta Alarcón Riquelme, who is scientific director of GENyO's Genomics Unit and Medical Genomics Department and GENyO's point person on PRECISESADS. "Instead of lumping all lupus patients together, for example, we can identify subdivisions of the disease based on their molecular patterns. This finer-grained diagnostic capability can help pharma companies choose the best treatments for each patient and develop new treatments, and it is particularly valuable for people suffering from less common, difficult-to-diagnose autoimmune diseases. The progress in this area is tremendously exciting."

Capturing the Opportunities of Precision Medicine

With the Atos computer and Intel technologies, GENyO is well prepared to capture the opportunities of precision medicine. "In this field, we have data and information, but we need knowledge," said Carmona-Sáez. "The cluster has the scalability to grow as the number of projects and amount of data and analysis continue to increase. It will support us as we move into applying artificial intelligence to heterogeneous data sets and to extract knowledge from them."

The ultimate beneficiaries of GENyO's work will be the people of Andalusia and others around the world who may gain access to new diagnostics and treatments. "The Department of Health has a vision and a plan that by 2024, every doctor in the region will be able to access and interpret the omics data coming from our labs, integrated with clinical health records, and available in an intelligent system to support the doctors," said GENyO's director, Dr. José Antonio Lorente. "If we do this, and if we continue to make breakthroughs in precision medicine, we can improve the quality of assistance the public health system can give our people. We can provide faster diagnoses, which will improve access to care, reduce waits for treatment, and reduce the suffering that results from delays. We will save lives and money."

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